



Volpe  
National  
Transportation  
Systems  
Center

# Volpe Center Highlights

Cambridge, Massachusetts

October 1999

## Focus

**Flying Over the Eye of the Hurricane: NASA Uses DOT Traffic Management System to Collect Data on Hurricane Floyd (FAA) (NASA)**

## Director's

### Notes



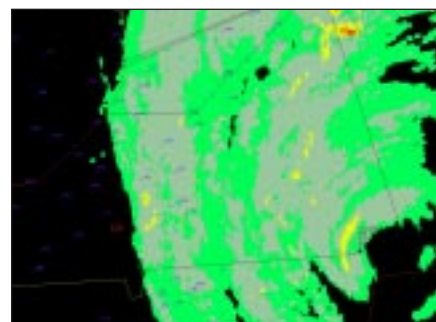
Dr. Richard R. John

On October 4, I joined Administrator Kelley S. Coyner and Deputy Administrator Stephen D. Van Beek at the American Association of State Highway and Transportation Officials (AASHTO) annual meeting in Tulsa, Oklahoma, for a formal signing of a Memorandum of Understanding (MOU) between the Research and Special Programs Administration (RSPA) and the New Mexico State Department of Highways and Transportation. Under the MOU, the Volpe Center will work with New Mexico over the next two decades to assess the inherent value of an innovative financing arrangement that includes a highway performance guarantee that should allow 120 miles of roadway to be rebuilt in a matter of years rather than decades, and save the state \$89 million in maintenance costs.

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Recently the National Aeronautics and Space Administration (NASA) found a novel application of the data compiled by the Volpe Center's Traffic Management System (TMS).

On the morning of September 15, a NASA B57 aircraft equipped for environmental research with 41 atmospheric sensors flew at 60,000 feet directly over the eye of Hurricane Floyd. This was the first time an environmental science aircraft of this type had ever overflown a hurricane and provided NASA Johnson Space Center (JSC) B57 Command Center in Houston with images and information in near real-time.



Airplane Image on the TMS Display Screen

The Command Center loses communication with an aircraft when it exceeds the range of VHF radio (approximately 120 nautical miles); command center personnel are usually unaware of what has occurred until the B57 lands. That is, any modification to the flight path to pick up particular readings or to avoid plumes from other jets is impossible.

On this flight, hurricane rain and wind patterns, position and flight path of the NASA B57, and information about other aircraft in the vicinity were gathered from Federal Aviation Administration (FAA) radar and other sources. This information was compiled at the TMS Hubsite at the Volpe Center and then transmitted over secure lines to the NASA's Ames Research Center (NASA Ames) in California where researchers used the TMS to image the specific area of Hurricane Floyd and the NASA B57. That image was then transferred to tape, and the tape was transmitted to the NASA/JSC Command Center.

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The Volpe Center has been working with the FAA and NASA Ames to provide a "feed" of TMS data to the research community at NASA Ames. TMS is the real-time, operational computer system developed by the Volpe Center that the FAA uses to predict, detect, and otherwise handle airspace congestion problems. NASA funds a feed that supports research into air traffic control and aircraft safety projects.

Results are not yet available but investigators are optimistic that many of the questions concerning the dynamics of tropical storms and aerosol (e.g., pollutant) dispersion and its effect on the atmosphere may be answered once the data gathered on this unique flight are analyzed.



***Promote public health and safety by working toward the elimination of transportation-related deaths, injuries, and property damage.***

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### ***Volpe Center Supports FAA Conference on Aging Aircraft in Albuquerque (FAA)***

Dr. Kemal Arin and Mr. George Neat of the Vehicle Crashworthiness Division participated as Session Chairs at the Third Joint FAA/DoD/NASA Conference on Aging Aircraft held in Albuquerque, New Mexico from September 20 to 23. Since 1989, the Volpe Center has been providing technical support to the FAA's William J. Hughes Technical Center in the National Aging Aircraft Research Program. Part of the Volpe Center's role involves communicating with the research community by participating in technical conferences. The FAA was the lead agency for this conference, and Dr. Thomas Flournoy, manager of the FAA's Aging Aircraft Program and the FAA's manager of Aging Aircraft work at the Volpe Center, was responsible for organizing the conference, with support from the Volpe Center. The purpose of the

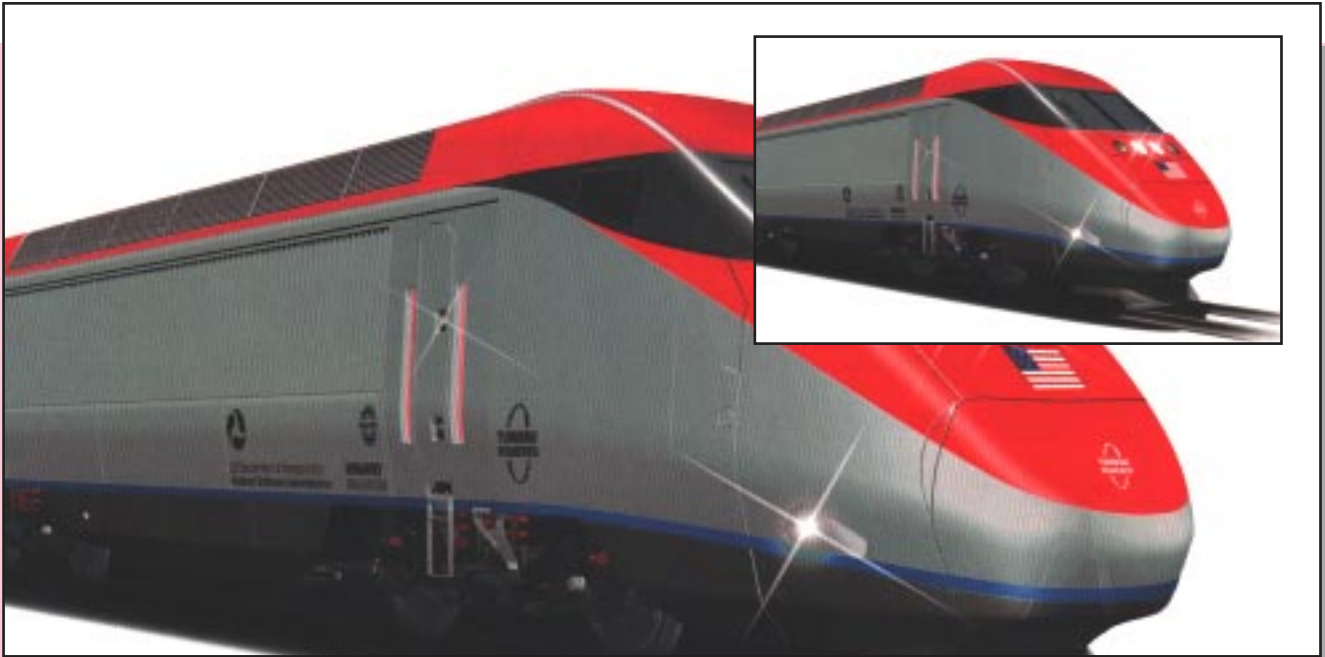
conference was to disseminate information on current practices and advances in technologies to ensure continued airworthiness of aging aircraft in the military and commercial fleets; four of the technical sessions were devoted to aging non-structural systems. The conference has been mentioned in the national press because of the issue of aging wiring addressed in these sessions. There was broad participation of government agencies at the conference, including U.S. Navy, U.S. Air Force, Army Tank Command, NASA, and FAA sponsors of work at the FAA Technical Center.

### ***Volpe Center and NHTSA Develop Fleet Systems Model in Crashworthiness Research Support (NHTSA)***

Mr. John Guglielmi of the Vehicle Crashworthiness Division has recently completed one phase of evaluating the Chevrolet C-1500 full-size pickup, one of the vehicles selected for study under the Fleet Systems Model program. The Vehicle Crashworthiness Division is supporting the NHTSA Crashworthiness Research Division in developing a Fleet Systems Model. The multi-purpose finite element model of this vehicle was developed by George Washington University's National Crash Analysis Center for frontal and side impacts. This vehicle model was initially used as a "bullet" vehicle during simulation runs where a few anomalies were detected, including no bumper-to-wheel contact, seat-back rotation, and excessive downward pitching of the transmission. Evaluation of this model for frontal applications is now complete. The model will be used to study vehicle aggressivity and fleet compatibility, and to determine vehicle design characteristics that will result in reduced injuries and fatalities in automobile crashes. Twelve finite element models of motor vehicles are being developed for NHTSA and the Volpe Center and are being evaluated to provide feedback to the model developers. A Technical Information Exchange (TIE) dated September 30, 1999, summarizes recommended changes to the model.

## ***Design Review of the Next Generation High-Speed Rail Program, Non-Electric Locomotive Development Program (FRA)***

On September 28, Mr. Michael Coltman of the High-Speed Ground Transportation Division attended a preliminary design review of the engine integration for the Federal Railroad Administration's (FRA) Non-Electric Locomotive Development Program at Bombardier's engineering facilities in Montreal, Quebec, Canada. Bombardier and the FRA have entered into a cooperative agreement to build and demonstrate a lightweight, high-speed, gas turbine-powered passenger locomotive. Bombardier has selected a Pratt and Whitney gas turbine as the primary engine for the demonstration train, scheduled to be tested in the fall of next year. The Volpe Center provides technology assessment support to the FRA under the Next Generation High-Speed Rail Program. Issues addressed in the design review were size, weight, airflow, and auxiliary system requirements for the engine. Integrated with the engine is a reduction gear originally designed to reduce the rotating speed of the gas turbine to speeds more appropriate for propellers. The locomotive application will couple to variable speed generators producing electrical power used to drive modern traction motors. The weight, fuel consumption, and performance of the engine across the range of operating conditions were addressed during the review.



*High-Speed Non-Electric Locomotive*

## ***Presentations at the Annual Technical Meeting of the Institute of Navigation Satellite Division (FAA)***

Dr. Michael Geyer of the Surveillance and Sensors Division and Ms. Karen Van Dyke of the Center for Navigation attended the Annual Technical Meeting of the Institute of Navigation (ION) Satellite Division, held on September 14 to 17 in Nashville, Tennessee. Satellite navigation specialists, managers, and policy makers from around the world gathered to explore significant developments in the areas of policy, equipment, and techniques.

Dr. Geyer co-authored and presented a paper entitled "FAA GPS Radio Frequency Interference Mitigation Program," based on the Volpe Center's support of the FAA's Office of Spectrum Policy and Management and activities related to that office. The Volpe Center is developing two systems for detecting and localizing sources of interference to the global positioning system (GPS) in the National Airspace System (NAS). These systems — the GPS Interference Location System for Handheld Use and the Airborne Radio Frequency Interference Location System — will shift to FAA use in the NAS in the coming year. The Center's work is sponsored by the FAA's Communications, Navigation, and Surveillance organization.

## ***Transportation Awareness Day***

On September 15, the Volpe Center served as host to Boston Properties (the management team of neighboring buildings) who sponsor an annual Transportation Awareness Day. The event makes information available to Cambridge-area employees on alternative means of transportation, including public transportation, bicycling, and shared commuting. On display were two automobiles, one electric and one powered by natural gas.

As part of a ONE DOT effort, several modal offices made a variety of transportation information available. The FRA provided information on grade crossing safety; the NHTSA brought attention to their Buckle Up Campaign; and FTA provided informational booklets on public transit and livable communities. The event, coordinated by Ms. Theresa McTague of the Office of Communications and Technology Outreach, was held on the grounds of the Volpe Center.



*Transportation Awareness Day*

## ***Intelligent Cruise Control System Final Report Approved for Publication (NHTSA)***

Mr. Joseph Koziol of the Accident Prevention Division was the project manager for the study resulting in the Volpe Center final report entitled "Evaluation of the Intelligent Cruise Control System" approved this month for publication by the NHTSA. The Center's evaluation was based on a 1-year test of an Intelligent Cruise Control (ICC) system involving 108 drivers in the State of Michigan. In the letter of approval, the NHTSA sponsor praised the report for its innovative analysis, solid evaluation, and important contribution to the body of information that is becoming available on the performance of advanced technology systems.

The ICC system tested automatically maintains a set time-headway with a preceding vehicle through throttle modulation and downshifting (but not braking). When traffic is encountered, ICC-equipped drivers are provided the convenience of some relief from manually engaging, disengaging, or resetting velocities, as is often the case with Conventional Cruise Control (CCC). When not in traffic, ICC functions in a manner similar to CCC. Use of the ICC system was generally associated with safer driving compared to manual control, and is projected to result in net safety benefits if widely deployed, based upon an assessment of various objective safety surrogate measures, driver perceptions, and modeling of the wide-scale deployment of ICC systems. The evaluation also addressed system performance, user acceptance, deployment issues, and impacts on the environment. The NHTSA Office of Vehicle Safety Research requested the transfer of the raw field data collected on the ICC System Evaluation Project and intends to use the data for the analysis of collision avoidance algorithms.

In a related activity, a quick response analysis was performed on the ICC System Evaluation data to establish correlations between driver-response time to average vehicle deceleration. A TIE document entitled "Response Time Versus Average Vehicle Deceleration" was prepared by Mr. Koziol and Ms. Suzanne Chen of the Operation Assessment Division for the NHTSA sponsor. The analysis determined that a weak trend was evident showing slightly faster response times for higher levels of deceleration.

## ***Volpe Center Demonstrates Vessel Tracking Technology to Saint Lawrence Seaway Development Corporation and Coast Guard (SLSDC)***

On September 20, Messrs. Kam Chin and David Phinney of the Center for Navigation, traveled to Massena, New York, to meet with the sponsors from the Saint Lawrence Seaway Development Corporation and Admiral James Hull, the U.S. Coast Guard Commander of the 9th District. At the meeting, Volpe Center staff conducted a vessel-

tracking demonstration using Automatic Identification System (AIS) technology. As part of the ONE DOT initiative, this technology presentation and discussion focused on the possibilities of a multimodal/user effort to create a unified vessel tracking and information system for use by all operating agencies and shippers throughout the Great Lakes and Saint Lawrence Seaway System. The Volpe Center is responsible for the design and implementation of the AIS technology that will identify and track all commercial vessels on the Seaway. This technology also will enable the automatic dissemination of waterway status to Seaway users, i.e., captains and pilots.

### ***Volpe Center Provides Emergency Support to FAA Meadows Field Airport Personnel (FAA)***

On September 8, Mr. Erik Ferland of the Airport Surface Division traveled to the Meadows Field Airport in Bakersfield, California to provide emergency support to FAA airport personnel in restoring service to the prototype communications system. Mr. Ferland's assistance and support were needed because this prototype system includes products that are no longer available or cannot be maintained through commercial sources. While at Meadows Field, Mr. Ferland assessed the current status of the system components in order to develop a plan to convert the system to the FAA standard fiber-optic design, within current funding constraints.

The Airport Surface Division of the Volpe Center provides continuing support to the Power Systems Management Division of the FAA and the FAA regions in the design/development and implementation of fiber-optic-based communications systems for airport equipment applications. This process began with the installation of a prototype system developed by the Airport Surface Division at the Meadows Field Airport. Following the success of the Bakersfield system, additional fiber-optic systems incorporating improvements and additional features were developed for and installed at the Denver and Los Angeles International Airports. These efforts have resulted in a standardized fiber-optic cable system design for airports, which achieves high reliability by providing redundant communication paths for all FAA on-airfield systems.



***Protect and enhance communities and the natural environment affected by transportation.***

### ***National R&D Plan for Aviation Safety, Security, Efficiency, and Environmental Compatibility Approval (RSPA)***

During 1999, the Transportation Strategic Planning and Analysis Office has been working with NASA, FAA, and Department of Defense (DoD) under Research and Special Programs Administration (RSPA) sponsorship, on the development of the National Science and Transportation Council (NSTC) document entitled "National R&D Plan for Aviation Safety, Security, Efficiency, and Environmental Compatibility." This plan presents a coordinated and comprehensive view of the relevant research being performed by NASA, FAA, and

DoD, as requested by the White House Office of Science and Technology Policy (OSTP). The plan was prepared at the Volpe Center, based upon materials supplied by the agencies and coordinated by NASA Headquarters. Approved by NASA Administrator Daniel S. Goldin, DoD Director of Defense Research and Engineering Dr. Hans Mark, and Secretary of Transportation Rodney E. Slater, the plan has been approved for dissemination by Neal Lane, Assistant to the President for Science and Technology. The plan supports development of final FY 2001 budget submissions by the three agencies. Public release of the document is scheduled for December 1999.

### ***Federal/State Collaboration on Environmental Compliance (USPS)***

Mr. Paul Bushueff of the Automation Technology Division and Mr. Edward Rynne of the United States Postal Service (USPS) demonstrated the Facility and Environmental Management Systems (FMS/EMIS) to the Pennsylvania Department of Transportation on September 28. Pennsylvania would be the second state to join

in a Federal and state collaborative development process for information systems to support the facilities and environmental management process. Discussions are underway with several other organizations, including the U.S. Department of Commerce and Pennsylvania Historic Museum Commissions. These initiatives are an outgrowth of participation at the last Transportation Research Board's (TRB) annual meeting.



***Ensure that the transportation system is accessible, integrated and efficient, and offers flexibility of choices.***

### ***Professional Capacity Building at the K-12 Level (FTA)***

Responding to an FTA request, the Volpe Center prepared and submitted a white paper to the FTA entitled "Review of the Benjamin Tasker Middle School Proposal Dated July 2, 1999." This was an evaluation of a proposal by the Bowie, Maryland public school system submitted under the Professional Capacity Building (PCB) Program of the Department of Transportation (DOT) to initiate transportation and Intelligent Transportation Systems (ITS) training programs in grades K through 12. The authors of this paper were Dr. Sylvia Harris, Mr. Joseph LoVecchio, and Ms. Margaret Zirker (EG&G/CSI).

The PCB Program of the DOT assists in the deployment of ITS through the development of appropriate ITS knowledge and skills in Federal, state, and local government agencies; the transportation industry; and the Nation's schools. PCB is a joint Federal Highway Administration (FHWA), Federal Transit Administration (FTA) program, directed by the DOT ITS Joint Program Office (JPO). The Volpe Center, at the request of the FTA, acts as program manager for the FTA ITS PCB program and in that role, develops and delivers awareness training on the application of ITS to public transportation.

### ***Challenges and Opportunities for Improving the Use of Weather Information to Support Transportation Final Report (RSPA)***

Mr. Michael Rossetti of the Transportation Strategic Planning and Analysis Office submitted the technical paper "Challenges and Opportunities for Improving the Use of Weather Information to Support Transportation" to the American Meteorological Society (AMS). The paper will be presented at the AMS annual meeting in Long Beach, California in January 2000. The paper, co-authored by Mr. Thomas Seliga of the Surveillance and Sensors Division and Mr. Basav Sen of EG&G Technical Services, Inc., details the Volpe Center's activities and national forums on weather and transportation over the last few years conducted under the Federal Transportation Science and Technology Strategy of the National Science and Technology Council (NTSC) through the Enhanced Transportation Weather Services Initiative. The forums brought together experts from the public and private sectors, with the goal of developing partnerships to capitalize on recent advances in meteorology and transportation. The paper reviews the findings of the Volpe Center's activities and outlines a set of objectives deemed worthy of national consideration for implementation during the first decade of the new millennium.

### ***Facilitating Deployment of Transportation Electronic Payment Systems (FTA)***

Ms. Leisa Moniz and Mr. Michael Dinning of the Infrastructure Protection and Operations Division participated in two industry conferences held in Washington, D.C., focusing on the deployment of advanced electronic payment system technology. At the ITS America Electronic Payment Systems (EPS) Task Force, which met September 22, applications of EPS to all modes of surface transportation were explored. As a result of this meeting, the Volpe Center will involve the ITS Task Force in formulating EPS guidelines that are being developed by the Center under the sponsorship of the FTA and the ITS JPO.

On September 22 and 23, Ms. Moniz and Mr. Dinning participated in the annual meeting of the Smart Card Forum, an industry association promoting the implementation of multi-use smart card programs. Mr. Dinning moderated a session on Security and Privacy in Transportation Programs, and Ms. Moniz gave a presentation on the smart card initiatives of the DOT. In addition, Mr. Dinning, co-chair of the Smart Card Forum's Transportation Work Group, was elected to be Special Advisor for Government Members by the Forum's Board of Directors.

The Volpe Center is facilitating the introduction of innovative electronic payment system technology within the transportation payment system infrastructure, through projects sponsored by the FTA, the ITS JPO, and state and local transportation agencies. These systems will utilize advanced technologies, such as smart cards, to enable multiple transportation agencies within a region to adopt a single, coordinated interoperable payment system.



*Smart Card in Use*

### ***Center for Navigation Represented at OCEANS '99 Conference***

Mr. Maurice J. Moroney of the Center for Navigation chaired a session on Marine Communications and made two presentations at the Oceans 99 Symposium held September 13 to 16 in Seattle, Washington. The symposium, which annually draws in excess of 3,000 attendees, was co-sponsored by the Institute of Electrical and Electronics Engineers and the Marine Technology society. One of the Volpe Center presentations, which was authored by David A. Phinney of the Center for Navigation, addressed critical elements for advanced electronics aids for navigation, and was based on developmental efforts in the Panama Canal. The second presentation outlined the project that is being implemented to employ modern technology to restore Central American marine navigation systems that were destroyed by hurricanes last year. The presentation was co-authored by Mr. Moroney and Senora Liana de Caceres, the Executive Secretary of the Consortium of Central American Maritime Transportation Authorities.

### ***Volpe Center Demonstrates Navigation and Communication Technologies at U.S.-Africa Transportation Ministerial (OST)***

Messrs. James Carroll and McCharles Craven of the Center for Navigation participated in the U.S.-Africa Transportation Ministerial hosted by DOT Secretary Rodney E. Slater at the Carter Presidential Center in Atlanta, Georgia, September 26 to 29. Dr. Stephen D. Van Beek, RSPA Deputy Administrator, requested that the Volpe Center exhibit the Differential Global Positioning System display and communications technology developed by the Center for Navigation for the Panama Canal Commission and St. Lawrence Seaway Development Corporation. The U.S.-Africa Ministerial presented an opportunity for Secretary Slater and African Ministers of Transport to discuss the challenges of building an African transportation system that can meet the needs of the 21st century.

## Economic Growth and Trade



**Advance America's economic growth and competitiveness domestically and internationally through efficient and flexible transportation.**

### ***Volpe Center Divisions Combine Data Gathering and Distribution Expertise to Address Airline Delays (FAA)***

Two Volpe Center divisions are partnering to combine two areas of expertise and provide synergistic benefits for two different FAA organizations. On September 23, Volpe Center staff from both the Surveillance and Sensors Division and the Automation Applications Division met with Ms. Deborah

Lucas, the FAA's Navigation and Landing Project Manager, and Mr. Michael McKinney of the FAA's Technical Center. The Surveillance and Sensors Division focused on how Runway Visual Range (RVR) data can be gathered at the Center from the 30 largest FAA Terminal Radar Control facilities. The Automation Applications Division area advised on using the TMS and sending the data to the FAA's Air Traffic Control System Command Center (ATCSCC) in Herndon, Virginia, and the airlines. RVR technology provides early indicators of changing weather conditions on active runways at airports.

As part of the Volpe Center's work on the Collaborative Decision Making (CDM) program for the FAA's Free Flight Phase 1 Program Office, the RVR data will be distributed to the ATCSCC and the airlines via the CDM Web server at the Center. The RVR data will help an expanded FAA community and the airlines to reduce delays through better flight planning enabled by more advance notice of changing weather conditions. The Volpe Center is a major contributor to the CDM program between the FAA and the airlines. The program is one way that enhancements are identified for the FAA's TMS.

### ***Volpe Center Staff Attend and Exhibit at New England Minority Enterprise Development Conference (OST)***

On September 13, Ms. Lynn Murray, Mr. Joseph Henebury, and Ms. Mary Vitiello of the Volpe Center attended the New England Minority Enterprise Development Conference in Boston. In addition, the Volpe Center featured an exhibit that presented information on contracting opportunities at DOT with a special emphasis on programs for small and disadvantaged businesses. The purpose of the conference was to highlight achievements of the members of the NE Minority Enterprise Development organization. The organization, founded 30 years ago, fosters the belief that economic success remains integral to social progress. Ms. Luz Hopewell, Director of the Office of Small and Disadvantaged Business Utilization (OSBDU), U.S. Department

The partnership with New Mexico is symbolic of the Volpe Center's emerging role as a national technical resource for state and local transportation agencies. During the past year, we began working with the Colorado Department of Transportation (DOT) to adapt a facilities management system that we initially developed for the U.S. Postal Service. In Florida, we are assisting the Executive Office of the Governor to develop a strategic plan to guide state policies and programs in space transportation and related space commerce and research and development; and, we are working with the Miami International Airport to develop a security master plan. In addition, we have been assisting state and local agencies in their efforts to deploy Intelligent Transportation Systems. The list is impressive and includes Caltrans, the Maryland State Highway Administration, Virginia DOT, as well as the City of Corpus Christi, Texas, and the Massachusetts Bay Transportation Authority.

State and local project activity is not only an increasing portion of our work, but it is also professionally rewarding for Volpe Center staff, as it provides opportunities to gain insights into the challenges associated with applying advanced technology in real-world settings. It is also emblematic of the devolution occurring in Federal programs. States and local agencies are afforded greater autonomy and control, and the Federal role is one of technical assistance and program support, more than one of guidance and control. In keeping with this policy shift, we need to anticipate and seek out opportunities to assist state and local agencies, in cooperation with DOT modal administrations, with programs that are delivered through partnerships with state and local agencies. For example, we are working with the FHWA to assist AASHTO in its efforts to conduct a national workshop on the use of Asset Management methods to ensure optimal transportation infrastructure maintenance and capital investment decisions.

**G**oing forward, state and local agencies represent an increasingly important element of our client portfolio. I challenge us all to help fulfill the vision of the Volpe Center as a valued national technical resource not only for our traditional Federal clients, but for state and local agencies as well.

of Transportation was a featured speaker in addition to OSBDU directors from the Departments of Defense, Commerce, and the Environmental Protection Agency. At the luncheon that followed, awards were conferred upon outstanding minority business owners by Massachusetts Governor Paul Cellucci and Congressman Michael Capuano.

### ***Tour of the Japanese Magnetic Levitation (Maglev) Test Sites***

During her visit to Japan in late August, Dr. Aviva Brecher of the Transportation Strategic Planning and Analysis Office was invited to tour the maglev test facilities for both the urban maglev and high-speed maglev to assess the technical feasibility and applicability to U.S. rail. In Nagoya, Dr. Brecher observed and rode the Chubu HSST-100, an electromagnetically linear motor car designed for speeds up to 100 km/h. This maglev motor car has been tested at several world Expos, and is being considered for applications in Japan, Mexico, Brazil, and the United States. In Yamanashi, Dr. Brecher toured the museum and control room and observed high-speed runs (about 450 km/h) of the MLX superconducting maglev prototype on an 18.6-km priority test track managed by the Central Japan Railroad. The track includes low- and high-speed switches, tunnels, steep grades, and curves. Dr. Brecher visited the Railway Technology Research Institute where she toured laboratories, attended technical and project status briefings, and obtained recent literature and videos (available upon request). An additional highlight was riding across Japan on the Shinkansen and several other types of electric trains, and enjoying a uniformly high level of service, comfort, and on-time performance.



*Japanese Maglev Test Sites*



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**In This Issue...** Flying over the eye of the hurricane: NASA uses DOT traffic management system to collect data on Hurricane Floyd

